Mucoviscidosis Testing in a Community Hospital

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The importance of early diagnosis of mucoviscidosis (cystic fibrosis of the pancreas) is well stressed by the fact that one of every three individuals born with this condition dies during the first year of life (Schwachman, 1962).

From birth, these patients have an elevated concentration of chloride ions in their sweat. Measuring this elevation appears to be one of the best methods of diagnosis (Warwick and Hansen, 1965).

This report summarizes our experience with sweat chloride determinations following stimulation by pilocarpine iontophoresis and utilizing a Combination Chloride Electrode (Orion).

Materials and Methods

In general, we followed the same procedure as reported by Kopito and Schwachman (1969). All determinations were made at room temperature.

1. The chloride electrode is filled with a solution consisting of 1M KNO_3, 0.03M KCl and saturated AgCl.
2. The meter is calibrated with standard solutions of 20 mEq Cl-per liter and 100 mEq Cl- per liter.
3. After calibration, the electrode is placed in a vertical position with the sensing crystal resting on several gauze pads moistened with ion free water.
4. A felt pad soaked with a 64 mg/100 ml pilocarpine-HCl solution is placed in the large slot of the iontophoresis attachment after excess saturant is removed.
5. A felt pad soaked with a 0.01M H_2SO_4 solution is placed in the small slot of the iontophoresis attachment after excess saturant is removed.
6. The assembly is strapped on the flexor surface of the forearm for five minutes while a current of one milliampere is delivered.
7. In newborns or infants, the assembly may be applied to the back instead of the forearm.

8. In children who complain of tingling or itching, the current may be reduced to 0.5 milliamperes for a short interval during the five minute period.
9. The assembly is removed and the test area is wiped with gauze moistened with distilled water and then blotted dry.
10. The electrode is blotted dry and immediately placed on the test area.
11. After the pointer stabilizes (10-15 seconds) a direct readout is made in milliequivalents of Cl- per liter.

RESULTS

We tested 118 individuals by this method. Our Cystic Fibrosis Clinic supplied the known afflicted patients. Most of their relatives were happy to cooperate also in the program. Patients with various ailments, mainly respiratory, were used as part of the control series. Healthy control individuals were picked at random from laboratory personnel and from their children.

DISCUSSION

As in most laboratory procedures, we found that individuals generally fell into three categories. One group represents those in which the results were clearly negative. In a second group, the results led to a diagnosis or high index of suspicion for the disease. The third group should be classed as borderline and here clinical follow-up and repeat testing are in order.

Several sources of error were found during the procedure, all of which were easily eliminated. No delay should occur in placing the electrode over the test area as the sweat evaporates rapidly (step #10). Excessive moistening of the skin area after sweat stimulation (step #9) should be avoided. Failure to remove excess saturant from the felt pads before placing them in the iontophoresis attachment slots (step #4 and step #5) was a source of error. Failure to control the restless patient would produce erroneous results.

We found that the five minute sweat stimulation period is optimum since no appreciable variation was noted when this period was prolonged to 10 or 15 minutes.

We have concluded that the Combination Chloride Electrode (Orion) provides a rapid (six minutes), harmless, and reliable screening method and aid in the diagnosis of mucoviscidosis that can be used on newborns, infants, children, and adults.

Literature Cited

Kopito, L., and H. Shwachman. 1969. Studies in cystic fibrosis: Determination of sweat electrolytes in situ with direct reading electrodes. Pediatrics, vol. 43, pp. 794-798.

Shwachman, H. 1962. The sweat test. Pediatrics, vol. 30, pp. 167-171.

Warwick, W. J., and L. Hansen. 1965. The silver electrode method for rapid analysis of sweat chloride. Pediatrics, vol. 36, pp. 261-264.

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